

Application No.: 10/510,475
Inventor: Goertz et al.
Reply of December 6, 2005
Reply to Office Action of Sept. 6, 2005
Docket No.: 53407

REMARKS/ARGUMENTS

Claim Rejections under 35 USC §103

The Examiner rejected claims 1-9 under 35 U.S.C. 103(a) as being unpatentable over UK 1187233 in view of Palazzotto et al. More specifically, the Examiner asserted:

...UK 1187233 discloses a process for preparing polyoxymethylene by polymerizing formaldehyde or trioxane or other source of oxymethylene units, in the presence of an organometallic complex cation of the formula (see pages 1-2). The disclosure of the reference differ[s] from the instant claims in that it does not disclose the use of a general formula I in claim 1 nor specific catalysts in claims 7 and 9. The Palazzotto reference discloses processes for the initiation of cationic polymerization of epoxy materials in that the oxymethylene is included.

The reference further discloses the salts of the organometallic cation have the formula II (see col. 3, line 60 et seq. in that M is a metal of group VIII such as Pd or Ir (lines 56-57), L7 is cyclic olefinic compounds of less than 100 C, such as cyclopentadiene, cyclohexadiene and cyclooctadiene must be included; pentamethyl-cyclopentadienyl (see col. 5, lines 10-30); L8 is a 4-membered saturated or unsaturated ring containing oxygen such as tetrahydrofuran, Nitriles, CO, amines---(see col. 6, lines 16-54), X is halide or BF₄⁻, PF₆⁻, SbF₆⁻, --- (see col. 8, lines 52 onto col. 9, line 6) (emphasis added).

It would have been obvious to one of ordinary skill in the art to form the oxymethylene as disclosed in UK 1187233 employing the catalyst of Palazzotto in order to gain the advantages of the combination of the references, that being a polyoxymethylene polymer which has the added properties of improving the thermal stability and wavelength of sensitivity (see col. 2, lines 10-12).

UK 1187233 discloses a process for preparing polyoxymethylene, by contacting a formaldehyde source with an organometallic cation catalyst.

Palazzotto discloses specific organometallic cation can be used for polymerizing epoxy component in that polyoxymethylene is included. The inclusion of said catalyst in the method for preparing polyoxymethylene would not provide an unexpected result to one of ordinary skill in the art. (emphasis added).

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to

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Docket No.: 53407

combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In chemical-type cases, it is generally well settled that "[t]he fact that a claimed species is or subgenus is encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness." *In re Baird*, 16 F.3d 380, 29 USPQ2d 1550 (Fed. Cir. 1994). "The fact that a claimed compound may be encompassed by a disclosed generic formula does not by itself render that compound obvious." *Id.*, citing *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). Indeed, where a prior art reference discloses a broad genus containing a large number of species, but does not contain a teaching or suggestion for one having ordinary skill in the art to select the particular species therein for combination or modification, then the particular species is nonobvious. *Id.* In sum, "[a] disclosure of millions of compounds does not render obvious a claim to three compounds, particularly when that disclosure indicates a preference leading away from the invention." *Id.* (emphasis added).

In the present case, the Applicants respectfully submit that the Examiner has not satisfied the required burden to establish a *prima facie* case of obviousness. More specifically, the Applicants respectfully submit that the prior art references cited by the Examiner, or that knowledge generally available to one having ordinary skill in the art, does not contain sufficient teaching, suggestion or motivation to combine/modify their teachings in the manner of the Applicants to create the present invention.

Page 3 of 7

Application No.: 10/510,475
Inventor: Goertz et al.
Reply of December 6, 2005
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Docket No.: 53407

Claim 1 of the present application recites a process for preparing polyoxymethylene by contacting a formaldehyde source with a metal group VIII catalyst containing one or two cyclooctadiene (COD) ligands and, optionally, up to four ligands selected from tetrahydrofuran or ligands displaceable by tetrahydrofuran. As is described in the examples contained in the present application (see in particular examples 2.1.2 and 2.2), the catalysts (and also the binuclear catalyst of claim 9) advantageously allow short induction times, i.e., the time which elapses from the mixing of the formaldehyde source with a catalyst to the "light-off" of the polymerization. Additionally, the present catalysts are tolerant toward impurities and water traces in the formaldehyde source (see example 2.1.4).

The Examiner admits that UK1187233 does not disclose, teach or suggest a process for preparing polyoxymethylene by contacting a formaldehyde source with a metal group VIII catalyst containing one or two cyclooctadiene (COD) ligands. On the contrary, UK 1187233 describes a method for preparing polyoxymethylene by polymerizing trioxane in the presence of a metallate catalyst.

Likewise, Palazzotto et al. (US 5,080,536) do not disclose, teach or suggest a process for preparing polyoxymethylene by contacting a formaldehyde source with a metal group VIII catalyst containing one or two cyclooctadiene (COD) ligands. On the contrary, Palazzotto et al. describe a process for polymerizing epoxy compounds, such as trioxane, in the presence of an organometallic catalyst of the formula $[(L^7)(L^8)M^m]^4X_r$ wherein M is selected from metals of the groups IVB, VB, VIB, VIIB and VIIIB. As disclosed in Palazzotto et al., L^7 is none, one or two π -electrons-contributing ligand and L^8 is none or 1 to 6 ligands contributing an even number of σ -electrons (Col. 3, line 66-Col. 8, line 7). While Palazzotto et al. disclose at Col. 5, lines 10 *et seq.* that, "... L^7 are the linear and cyclic olefinic and acetylenic compounds having less than 100 carbon atoms, preferably having less than 60 carbon atoms, and up to 10 hetero atoms selected from nitrogen, sulfur, oxygen, phosphorus, arsenic, selenium, boron, antimony, tellurium, silicon, germanium and tin, such as, for example, ethylene...and substituted and unsubstituted carboxylic and heterocyclic aromatic ligands having up to 25 rings and 100 carbon atoms and up to 10 hetero atoms selected from nitrogen, sulfur, oxygen, phosphorus, arsenic, selenium, boron,

Page 4 of 7

Application No.: 10/510,475
Inventor: Goertz et al.
Reply of December 6, 2005
Reply to Office Action of Sept. 6, 2005
Docket No.: 53407

antimony, tellurium, silicon, germanium and tin, such as, for example, *n*5-cyclopentadienyl...,” column 5, line 10 *et seq.* of the Palazzotto et al. reference DOES NOT list or identify cyclooctadiene (COD) as comprising a suitable L⁷ ligand. Similarly, the listing of suitable organometallic catalysts disclosed at column 11, lines 37 *et seq.* of the Palazzotto et al. reference does not describe cyclooctadiene (COD) as a suitable L⁷ ligand. Of further note, Palazzotto recites a vast number of cycloalkenes and cyclopolyenes, *inter alia*, cyclooctatetraene, but does not disclose, teach or suggest COD and does not disclose, teach or suggest binuclear catalysts.

Despite this fact, the Examiner asserts that, “L⁷ is cyclic olefinic compounds of less than 100 C (carbon)...[and] cyclooctadiene must be included...,” such that “[i]t would have been obvious to one of ordinary skill in the art to form the oxymethylene as disclosed in UK 1187233 [by] employing the catalyst of Palazzotto in order to gain the advantages of the references, that being a polyoxymethylene polymer which has the added properties of improving thermal stability and wavelength and sensitivity. (see col. 2, lines 10-12)” (emphasis added).

The Applicants respectfully submit, however, that UK 1187233 and Palazzotto are wholly silent with regard to induction time and impurity problems such that a person having ordinary skill in the art would not have been motivated, or have had any incentive, to select organometallic catalysts containing at least one cyclooctadienyl ligand, or binuclear iridium catalyst of claim 9, to arrive at catalysts permitting short induction time and being tolerant toward water/impurities, and even more so in view of the fact that none of the references recite cyclooctadiene as a suitable ligand.

Additionally, Applicants respectfully submit that Palazzotto et al. discloses that “...L⁷ are the linear and cyclic olefinic and acetylenic compounds having less than 100 carbon atoms...,” and does not disclose the selection of cyclooctadiene. Consequently, because the number of possible L⁷ compounds described and defined by Palazzotto et al. is of such extraordinary and variable breadth and scope, Palazzotto et al. does not contain sufficient teaching, suggestion or motivation for one having ordinary skill in the art to specifically select cyclooctadiene for combination and/or modification as asserted by the Examiner to create the present invention.

Furthermore, the Examiner asserts that one having skill in the art would have been

Page 5 of 7

Application No.: 10/510,475
Inventor: Goertz et al.
Reply of December 6, 2005
Reply to Office Action of Sept. 6, 2005
Docket No.: 53407

motivated to combine/modify the references, "in order to gain the advantages of the combination of the references, that being a polyoxymethylene polymer, which has the added properties of improving the thermal stability and wavelength of sensitivity (see col. 2, lines 10-12)." However, Palazzotto et al. specifically teach the preferred use of 1,3 cyclohexadiene, cyclopentadiene, 1,4 cyclohexadiene, η^6 -cycloheptatriene, and η^8 -cyclooctatetracene such that one having ordinary skill in the art would be led away from using COD. Consequently, there is simply no motivation to modify Palazzotto et al. to use COD instead of the many ligands that are specifically identified therein; "[a] disclosure of millions of compounds does not render obvious a claim to three compounds, particularly when that disclosure indicates a preference leading away from the invention." Additionally, because Palazzotto et al. is silent regarding the use of COD and preferably teaches the use of 1,3 cyclohexadiene, cyclopentadiene, 1,4 cyclohexadiene, η^6 -cycloheptatriene, and η^8 -cyclooctatetracene, it more appears that the Examiner has impermissibly used the Applicant's disclosure as a roadmap to reconstruct the invention.

Finally, "Applicant[s] can rebut a presumption of obviousness based on a claimed invention that falls within a prior art range by showing "(1) [t]hat the prior art taught away from the claimed invention...or (2) that there are new and unexpected results relative to the prior art." *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004) (emphasis added). In the instant case, the Examiner asserts that one having skill in the art would have been motivated to combine/modify the references, "in order to gain the advantages of the combination of the references, that being a polyoxymethylene polymer, which has the added properties of improving the thermal stability and wavelength of sensitivity (see col. 2, lines 10-12)." Consequently, based on the Examiner's statement and the fact that the prior art cited by the Examiner is silent regarding the present invention's short induction times and tolerances to water and impurities (See Applicants' experimental examples 2.1 and 2.2), one having skill in the art would not expect the polyoxymethylene polymer produced from the combination of the references to have the properties of the present invention, but rather, merely have improved thermal stability and wavelength of sensitivity. As a result, the present

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Inventor: Goertz et al.
Reply of December 6, 2005
Reply to Office Action of Sept. 6, 2005
Docket No.: 53407

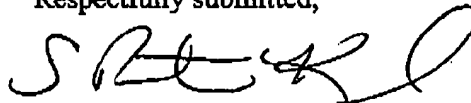
invention's short induction times and water and impurity tolerances are new and unexpected results relative to the prior art such that the present invention is also nonobvious in this regard.

For the reasons set forth above, the rejection should be reversed.

Conclusion

Applicants respectfully submit that the present application is in condition for allowance, which action is courteously requested. Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees to Deposit Account No. 141437. Please credit any excess fees to such deposit account.

Respectfully submitted,



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